National Aeronautics and
Space Administration

technology solution

Optics

Increased Efficiency Nonlinear Optical Interactions

A method to reduce spatial and temporal separation in nonlinear optics.

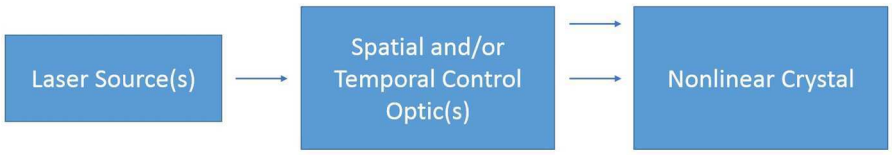
NASA Langley Research Center has developed a method to introduce a passive optical element to improve the efficiency of nonlinear optics. The additional optical element is used to compensate for the temporal and lateral separation of pulses commonly caused by a nonlinear crystal. These separations result in significant loss of efficiency in the nonlinear interaction. By choosing an appropriate optical element for a system, both spatial and temporal separation problems can be addressed by altering the pulses before they reach the nonlinear crystal.

BENEFITS

- Can decrease separation for both lateral and temporal components of a pulse
- Maximizes pulse overlap inside the crystal, rather than the input, to maximize interaction efficiency
- Increases efficiency of nonlinear optical interactions

THE TECHNOLOGY

The optical element is designed so that the pulses completely overlap in the center of the nonlinear crystal, resulting in optimized efficiency of the nonlinear interaction. This technique has been demonstrated with a Yttrium Orthovanadate (YV04) passive element and a KTP (potassium titanyl phosphate) crystal for second harmonic generation, but the concept can be applied to any nonlinear optical interaction where two input beams have different polarizations. Although second harmonic generation is most common, this method can be used with third and fourth harmonic generation as well. In addition, although KTP nonlinear crystals are commonly used, this method could be applied to other crystal types as well.



Schematic illustrating the invention

APPLICATIONS

The technology has several potential applications:

- Telecommunications
- Lasers
- Electro-optics

PUBLICATIONS

Patent No: 7,912,101

More Information

National Aeronautics and Space Administration

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